**State of California**
**California Environmental Protection Agency**
**Air Resources Board**

# 2004 Thermal Spraying Facility Survey
# Draft Report

**March 2004**

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## Acknowledgements

The Air Resources Board would like to thank the companies that responded to our 2004 Thermal Spraying Facility Survey and the staff at the following air districts:

Bay Area Air Quality Management District
Feather River Air Quality Management District
Imperial County Air Pollution Control District
North Coast Unified Air Quality Management District
Sacramento Metropolitan Air Quality Management District
San Diego County Air Pollution Control District
San Joaquin Valley Unified Air Pollution Control District
San Luis Obispo County Air Pollution Control District
South Coast Air Quality Management District
Ventura County Air Pollution Control District
Yolo-Solano Air Quality Management District

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| | |
|---|---|
| **APCD** | Air Pollution Control District |
| **AQMD** | Air Quality Management District |
| **ARB** | Air Resources Board |
| **ATCM** | Airborne Toxic Control Measure |
| **HEPA** | High Efficiency Particulate Abatement |
| **HVOF** | High Velocity Oxy-Fuel |

# I. INTRODUCTION

Thermal spraying (or metallizing) is a process in which metals are deposited in a molten or nearly molten condition to form a coating. During the spraying process, metal fumes or small particles are released into the air. The materials that are used for thermal spraying include pure metals, metal alloys, carbides, oxides, ceramics, and ceramic metals (cermets). Some of the ingredients found in these products are classified as toxic air contaminants or other chemicals of concern that can result in adverse health impacts. Appendix A contains fact sheets for some of the airborne pollutants that are generated during thermal spraying operations. The Air Resources Board (ARB/Board) staff is investigating the potential health risks associated with the air emissions from thermal spraying activities.

As part of this investigation, ARB staff conducted a survey of facilities in California that may perform thermal spraying. Survey candidates were identified based on data provided by local air districts; industry organizations; internet searches; and phone directory searches. In January 2004, ARB staff began contacting facilities by phone, FAX, and mail to gather data on thermal spraying operations. The survey collected information on thermal spraying processes, pollution control devices, material usage, and operating parameters. A copy of the survey form is contained in Appendix B.

Prior to surveying thermal spraying facilities, ARB staff conducted a survey of thermal spraying material manufacturers. The 2003 manufacturer survey collected sales data for calendar year 2002. The survey focussed on materials containing chemicals of concern (e.g., chromium and nickel). Based on this survey, more than 100 tons of thermal spraying materials containing chemicals of concern were sold or distributed in California during 2002. A report of the manufacturer survey results can be obtained on ARB's website (http://www.arb.ca.gov/coatings/thermal/thermal.htm).

# II. BACKGROUND

Thermal spraying is used in a wide variety of industries for numerous applications. One application that has become increasingly important is the use of thermal spraying as a replacement for hard chromium electroplating. Hard chromium electroplating has played an essential part in the managing, manufacturing, repair and maintenance operations for the military and industry. However, this process uses hexavalent chromium, which has been identified by the United States Environmental Protection Agency and ARB as a toxic air contaminant. Due to the health risk to employees and the cost to comply with State and federal environmental laws, industry and the military are seeking alternatives to hard chromium electroplating. One potential alternative is thermal spraying. Some thermal spraying materials contain chromium, which can generate hexavalent chromium air emissions when heated. As a result, a Board member requested that staff examine the potential health risks associated with thermal spraying activities.

## III. OVERVIEW OF THERMAL SPRAYING PROCESSES

ARB's thermal spraying facility survey gathered data on materials used by California businesses in the following processes:

(1) Flame Spraying;
(2) Plasma Spraying;
(3) Twin-Wire Electric Arc Spraying;
(4) High Velocity Oxy-Fuel (HVOF) Spraying; and
(5) Detonation Gun Spraying.

All of these processes use thermal and kinetic energy to deposit material onto a surface. Material is fed into a thermal spray gun, melted and applied to the surface in molten or semi-molten droplets, using compressed air or another gas. A brief description of each process is provided below.

### Flame Spraying

Flame spraying is accomplished using materials in either a powder form or a wire/rod form. The flame is produced using acetylene, propane, or another flammable gas. Flame spraying achieves particle velocities from 40 m/sec to 350 m/sec, depending on the type of material and equipment being used. Flame spraying achieves deposition rates from 10 kg/hr to 60 kg/hr.

### Plasma Spraying

A plasma jet is generated by feeding a gas (e.g., hydrogen, nitrogen, argon, or helium) through an electric arc which ionizes the gas. At the core of the plasma the temperature can reach as high as 30,000˚F. Therefore, plasma spraying is used for ceramics and other materials that cannot be melted in other thermal spraying processes. The plasma process can generate particle velocities greater than 500 m/sec and deposition rates of 5 kg/hr.

### Twin-Wire Electric Arc Spraying

In this process, wires of opposite polarity are used to create an electric arc which melts the two wires at the tips and creates molten droplets. Twin-wire electric arc processes deposit up to 60 kg/hr of coating material with particle velocities as high as 250 m/sec.

### High Velocity Oxy-Fuel (HVOF)

HVOF is another combustion process that uses oxygen and a fuel gas (e.g., hydrogen, methane, etc.) to melt the feed powder. HVOF guns have a unique nozzle design that produces extremely high velocity gas to propel molten drops to the part's surface. Particle velocities can reach 1000 m/sec with deposition rates up to 5 kg/hr.

### Detonation Gun

Powder and a gas mixture are fed into the barrel of the detonation gun, where a spark ignites the gas. The resulting explosion melts the powder and propels it at a very high velocity onto the surface being coated. Detonations can occur more than 5 times per second. Particle velocities can reach 800 m/sec with deposition rates up to 6 kg/hr.

## IV. SURVEY RESULTS

The 2004 thermal spraying facility survey included 95 companies identified by the ARB as businesses that potentially conduct thermal spraying. A copy of the survey form is contained in Appendix B. ARB also received assistance and survey data from staff at local air districts. In some cases, district personnel visited potential facilities and verified the processes and operating status.

The survey had a response rate of 83%, with 46 companies having active thermal spraying operations and 33 companies that did not conduct thermal spraying. In some cases, companies had previously conducted thermal spraying but were no longer doing so. Some of these inactive facilities ended their thermal spraying operations several years ago, while others ceased thermal spraying activities within the last two years. Reasons for ending thermal spraying activities included customer complaints, shifting to a different technology, and expiration of contracts for providing thermal spraying services. Seven businesses that were contacted did not submit survey data in a timely fashion and are considered non-responders. Nine companies in the survey pool could not be contacted, because the business had shut down or ARB staff was unable to find a valid phone number and address. Table 1 summarizes the survey responses.

**Table 1: Survey Response Summary**

| Facility Description | # of Companies | % |
|---|---|---|
| Active thermal spraying operation | 46 | 48% |
| No longer conducts thermal spraying | 12 | 13% |
| Does not conduct thermal spraying | 21 | 22% |
| Did not respond to survey | 7 | 7% |
| Business is shut down or could not be contacted | 9 | 10% |
| **Total =** | **95** | **100%** |

In addition to the facilities summarized above, ARB staff contacted a sampling of 16 aerospace companies and 26 welding companies to determine if they also conducted thermal spraying operations. None of these additional companies said they conduct thermal spraying. Table 2 is a listing of companies that participated in the survey, and Table 3 is a listing of companies that did not respond to the survey.

**Table 2: List of Companies that Participated in the Survey**

| | | | |
|---|---|---|---|
| 1. | Abrasive Dynamics | 41. | Hixson Metal Finishing |
| 2. | Adams Metallizing and Grinding | 42. | Hot Section Technologies |
| 3. | Aero Engines Inc. | 43. | IFG, Inc. (Industrial Flamespraying & Grinding) |
| 4. | Aero Turbine Inc. | 44. | Ketema/A&E Division |
| 5. | All Metals Processing of Orange Co. | 45. | L C Busler's Machine & Repair |
| 6. | American Alloy Welding & Machine Co., Inc. | 46. | LNL Anodizing Inc. |
| 7. | B&B Manufacturing Co. | 47. | Martin's Metal Fabrication & Welding Inc. |
| 8. | Babbitt Bearing Company | 48. | McCann Machine & Manufacturing |
| 9. | Bay Machine & Fabrication | 49. | Metal Fusion |
| 10. | Bender Machine Inc. | 50. | Omohundro Co. |
| 11. | Bishop Electronics Corp. | 51. | Pamarco Western |
| 12. | Black Oxide Industries, Inc. | 52. | Pentagon |
| 13 | Boeing North American, Inc. Rocketdyne | 53. | Plasma Coating Corp. |
| 14. | California Metal Spray | 54. | Plasma Technology Incorporated |
| 15. | Carlson & Beauloye Inc. | 55. | Powdercoat Services, Inc. |
| 16. | Chem Tronics Inc. | 56. | Precision Balancing Service |
| 17. | Chromalloy Los Angeles | 57. | Process Materials |
| 18. | Chromalloy San Diego | 58. | Proto Space Engineering |
| 19. | Compressor Parts & Repair Inc. | 59. | R.W. Lyall & Co. Inc. |
| 20. | D&V Machine Shop & Pump Co. Inc. | 60. | Ralph C. Crawford Co. |
| 21. | Del West Eng, Inc. | 61. | Reliable Capacitor Co. |
| 22. | Delta Sandblasting Co., Inc. | 62. | Rohr Inc, Unit No. 01 |
| 23. | Dentoni's Welding and Machine Shop | 63. | Sanders Welding & Sandblasting |
| 24. | Drilube Co. Lubrication | 64. | Santa Fe Machine Works, Inc. |
| 25. | Eastern Municipal Water District | 65. | Sermatech International Inc. (Airfoil Technologies Intl.) |
| 26. | Electro-coatings of California | 66. | Solar Turbines - Pacific Hwy |
| 27. | Electrocube Inc. | 67. | Specialty Engineering |
| 28. | Electrolurgy Inc. | 68. | Stanley Electric Motor Co. Inc. |
| 29. | Electro-Mechanical Manufacturing Co. | 69. | Surface Modification Systems Inc. |
| 30. | Eliminator Manufacturing | 70. | Thompson Machining |
| 31. | Elpac Electronics Inc. | 71. | Thunder Machine Works Inc. |
| 32. | F-Dyne Electronics, Southern Electronics | 72. | Tosoh |
| 33. | Flame Spray Inc. | 73. | Turbine Metal Technology (TMT) Research Development, Inc. |
| 34. | General Atomics Energy Products Sorrento Electronics | 74. | United Airlines MOC |
| 35. | General Dynamics – Land Systems | 75. | USN 32nd St Naval Station |
| 36. | General Grinding Inc. | 76. | USN Aviation Depot |
| 37. | General Magnaplate | 77. | Vaughan's Industrial Repair Co., Inc. |
| 38. | General Plating | 78. | Vincent Electric Motor Co. Inc. |
| 39. | Greenwood's Machine and Fabrication Inc. | 79 | Vivid Inc. |
| 40. | Herboth's Machine Shop | | |

**Table 3: List Of Companies That Did Not Respond to the Survey**

| | | | |
|---|---|---|---|
| 1. | Ace Metallizing Co. | 5. | Koffler Electrical Mechanical Apparatus Repair, Inc. |
| 2. | Baghouse and Industrial Sheetmetal | 6. | Premier Turbines |
| 3. | Electric Motor Work Inc. | 7. | Wymore Inc. |
| 4. | Golden West Machine, Inc. | | |

Table 4 contains a summary of key survey results. More detailed results are provided in subsequent sections of this report.

**Table 4: Key Survey Results**

| | |
|---|---|
| Number of facilities that were surveyed | 95 |
| Number of facilities that participated | 79 |
| Number of facilities that conduct thermal spraying in California | 46 |
| Number of facilities that reportedly use products containing chromium | 24 |
| Number of facilities that use air pollution control devices | 40 |
| Reported usage of thermal spraying materials | 63 tons |

## Thermal Spraying Processes

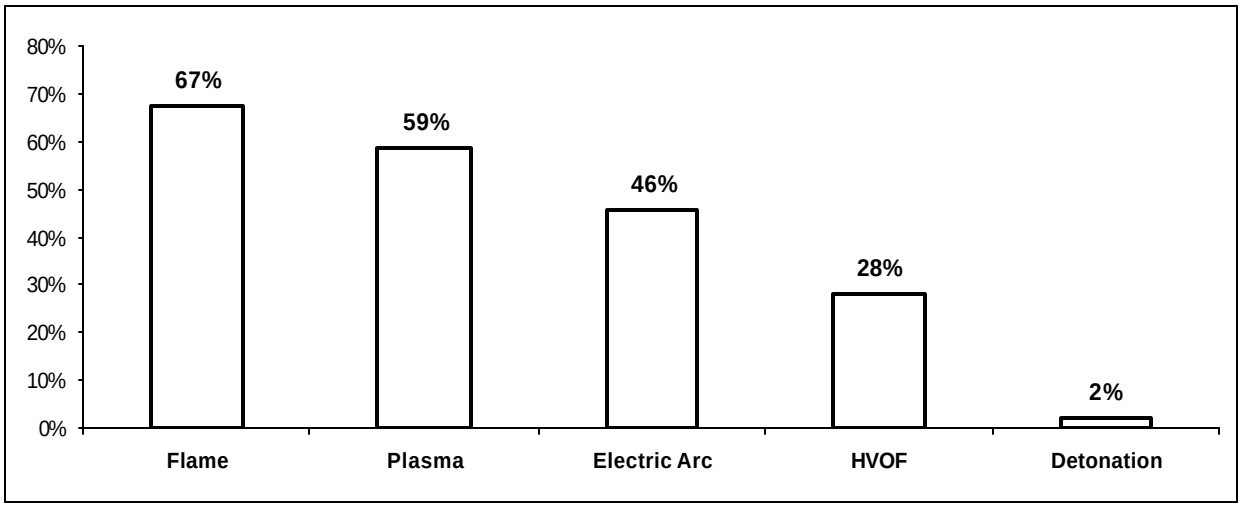
The survey data on the thermal spraying processes conducted at each facility indicate that most facilities use more than one process. The most prevalent types of thermal spraying are flame spraying and plasma spraying, followed by twin-wire electric arc, HVOF, and detonation gun processes.

Table 5 displays the process combinations that were reported and the associated number of facilities that were equipped to use these processes. Figure 1 illustrates the percentage of facilities that use a given process.

**Table 5: Process Summary**

| # of Facilities | Flame | Plasma | Electric Arc | HVOF | Detonation |
|---|---|---|---|---|---|
| 14 | X | | | | |
| 6 | | X | X | | |
| 5 | X | X | | | |
| 5 | X | X | X | X | |
| 3 | | | X | | |
| 3 | | X | | X | |
| 2 | | X | X | X | |
| 2 | X | | X | | |
| 2 | X | X | | X | |
| 2 | X | X | X | | |
| 1 | | X | | | |
| 1 | X | X | X | X | X |
| **Total Number of Facilities that Use Each Process:** | | | | | |
| **46** | **31** | **27** | **21** | **13** | **1** |

**Figure 1: Percent of Facilities That Use Each Type of Thermal Spraying Process**

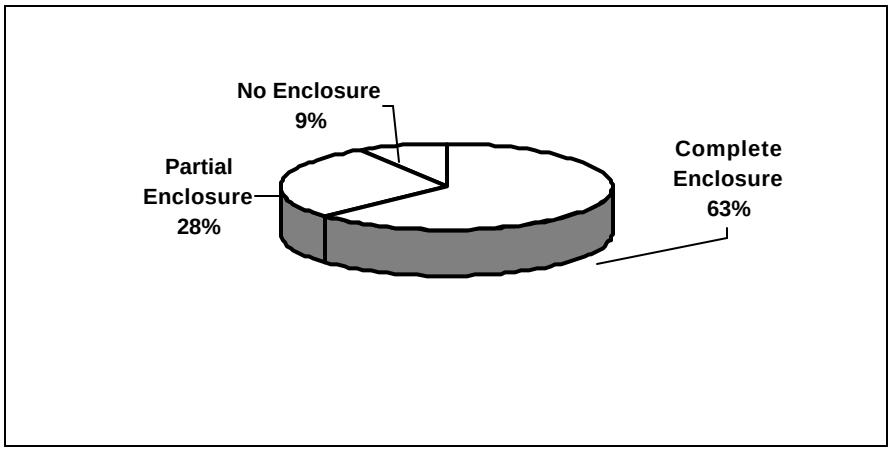



* The total percentage adds up to more than 100%, because each facility could report multiple processes.

## Control Devices

The survey collected data on the type of booth enclosures that are used for thermal spraying activities and the associated air pollution control devices. Most facilities use a booth for thermal spraying and many shops have multiple booths, so the total number of booths was 80. In most cases, a complete booth enclosure is used, rather than a partial enclosure with an open front. Figure 2 illustrates the percentage of facilities that have each type of enclosure.

**Figure 2: Percent of Facilities That Have Booth Enclosures**



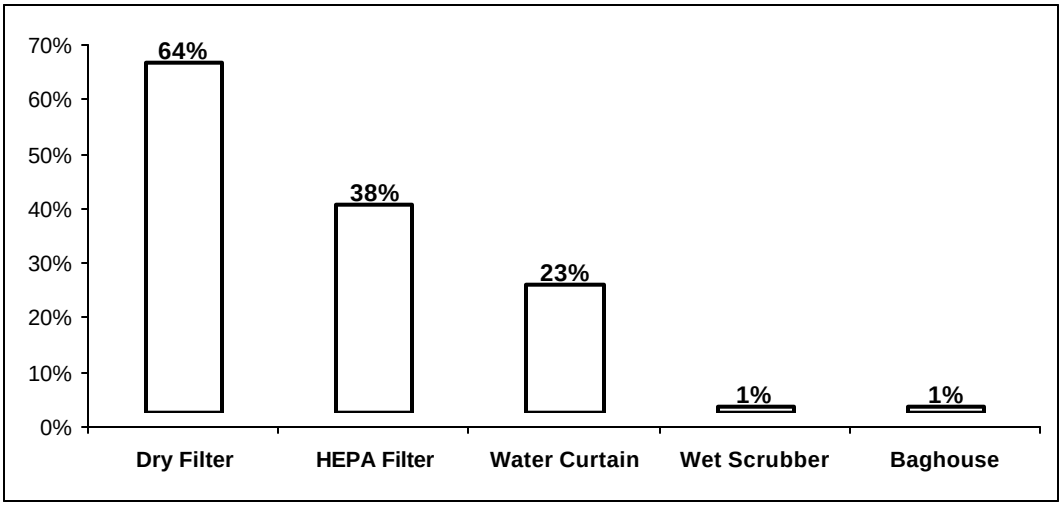

Most of the facilities (87%) that were surveyed use a control device to limit air emissions from thermal spraying operations. In addition, 88% of the facilities that reported the use of products containing chromium have control devices. Table 6 displays the control devices that were reported and the number of booths that use each type of device. In some cases, multiple control devices are identified. This was either due to the use of multiple control devices on one booth (e.g., a dry filter followed by a HEPA filter) or

because different devices are used on different booths at the same facility. Figure 3 illustrates the percentage of booths that use a given device.

**Table 6: Control Device Summary**

| # of Booths | Complete Enclosure | Partial Enclosure | Dry Filter | HEPA Filter | Water Curtain | Wet Scrubber | Baghouse |
|---|---|---|---|---|---|---|---|
| 24 | ✕ | | ✕ | | | | |
| 21 | ✕ | | ✕ | ✕ | | | |
| 13 | ✕ | | | | ✕ | | |
| 5 | | ✕ | | | ✕ | | |
| 4 | | ✕ | ✕ | | | | |
| 4 | ✕ | | | ✕ | | | |
| 3 | | ✕ | | ✕ | | | |
| 2 | | ✕ | | | | | |
| 2 | | ✕ | ✕ | ✕ | | | |
| 1 | ✕ | | ✕ | ✕ | ✕ | | |
| 1 | ✕ | | | | | ✕ | |
| 1 | ✕ | | | | | | ✕ |
| **Total Number of Booths:** **81** | **65** | **16** | **52** | **31** | **19** | **1** | **1** |

**Figure 3: Percent of Booths That Use Each Type of Control Device**




* The total percentage adds up to more than 100%, because some booths have multiple control devices.

The survey also requested information on the changeout frequency for control devices. Almost half of the facilities provided useful responses to describe how often they change their filters or clean out their water curtain sumps. Based on the data that we received, it appears that most facilities conduct changeouts once or twice a year. Table 7 summarizes the changeout frequency data.

**Table 7: Control Device Changeout Frequency**

| # of Changeouts Per Year | % of Facilities* |
|---|---|
| Less than once per year | 14% |
| 1 | 32% |
| 2 | 23% |
| 3 | 5% |
| 4 | 5% |
| 12 | 9% |
| Changeout Frequency Based on Pressure Drop Readings or Automatic Filter Purges | 14% |

*Total does not add up to 100%, due to rounding.

## Material Usage

The facility survey requested that responders indicate whether they used thermal spraying products that contained chromium, nickel, cobalt, or manganese. These chemicals were some of the top ingredients identified during ARB's survey of thermal spraying material manufacturers. The facility survey also collected data on other metals contained in the products and total annual usage of thermal spraying materials. Material usage and ingredient data were obtained from all but one of the active facilities. For the 45 facilities that provided usage data, 76% use products that contain chemicals of concern and 53% use products containing chromium. Total usage quantities reported in the facility survey are significantly less than the 2002 sales quantities reported by manufacturers (63 tons vs. 103 tons). The manufacturer survey includes some products that were sold to distributors and may not be used in California, but a large difference still exists after accounting for distributor sales. ARB will be working with manufacturers and facilities to identify possible explanations for this discrepancy. Table 8 summarizes the types and total usage of materials reported.

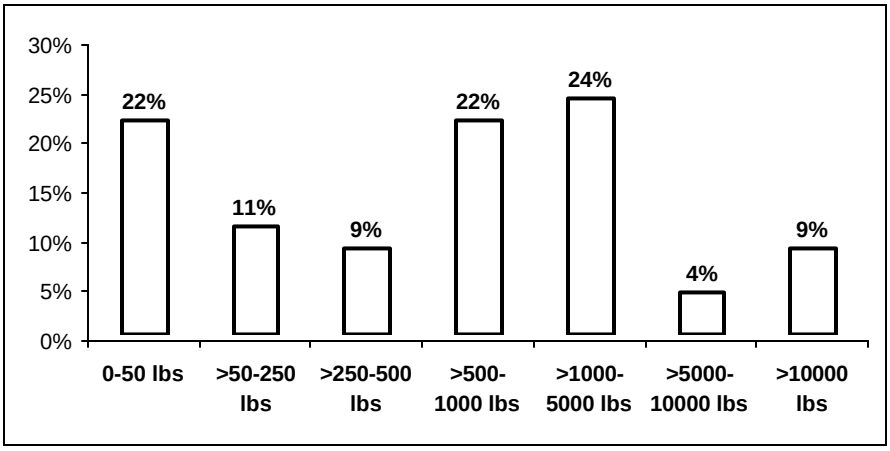
**Table 8: Material Usage**

| # of Facilities | Powder | Wire | Chromium | Nickel | Other Chemicals of Concern |
|---|---|---|---|---|---|
| 13 | ✕ | ✕ | ✕ | ✕ | ✕ |
| 5 | | ✕ | | | |
| 4 | | ✕ | | | ✕ |
| 3 | ✕ | | | | |
| 3 | ✕ | | ✕ | ✕ | |
| 3 | ✕ | | ✕ | ✕ | ✕ |
| 2 | ✕ | | | | ✕ |
| 2 | | ✕ | | ✕ | ✕ |
| 2 | ✕ | ✕ | | ✕ | |
| 2 | ✕ | ✕ | | | |
| 1 | ✕ | ✕ | ✕ | ✕ | |
| 1 | ✕ | ✕ | | ✕ | ✕ |
| 1 | ✕ | | ✕ | | |
| 1 | | ✕ | ✕ | ✕ | ✕ |
| 1 | | ✕ | ✕ | ✕ | |
| 1 | ✕ | | ✕ | | ✕ |
| **Total Quantity of Powder & Wire Reported = 63 tons** | | | | | |

* Other Chemicals of Concern Include: Copper, Cobalt, Manganese, Antimony, Cadmium, and Lead.

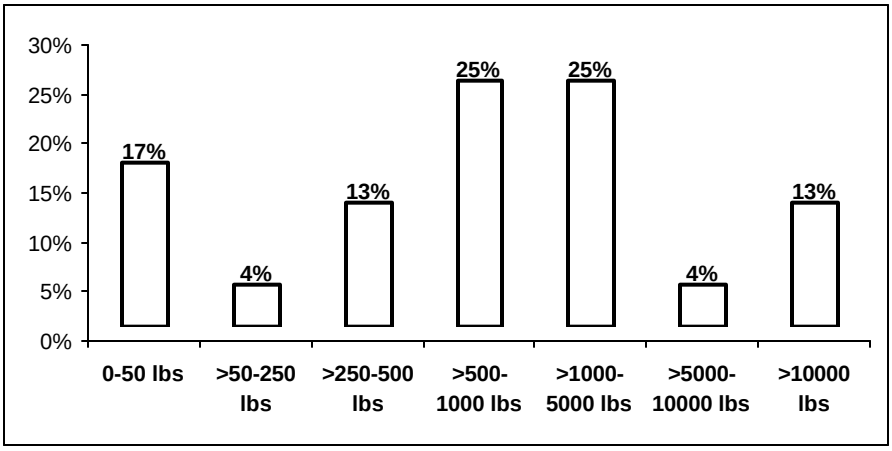
Figure 4 illustrates different usage levels and the corresponding number of facilities in each level. Figure 5 is a similar type of chart, but it only includes facilities that use products containing chromium. In both cases, more than half of the facilities use more than 500 lbs/yr of thermal spraying products. More than 75% use more than 50 lbs/yr of products. All of the facilities that use more than 250 lbs/yr of products have control devices.

**Figure 4: Percent of Facilities in Each Usage Group – All Reported Products**




*Total does not add up to 100%, due to rounding.

**Figure 5: Percent of Facilities in Each Usage Group – Products With Chromium Only**

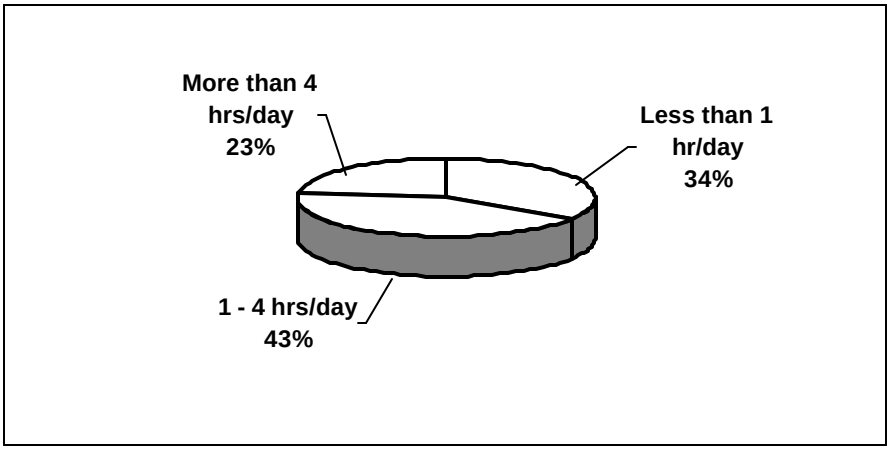



*Total does not add up to 100%, due to rounding.

## Business Practices

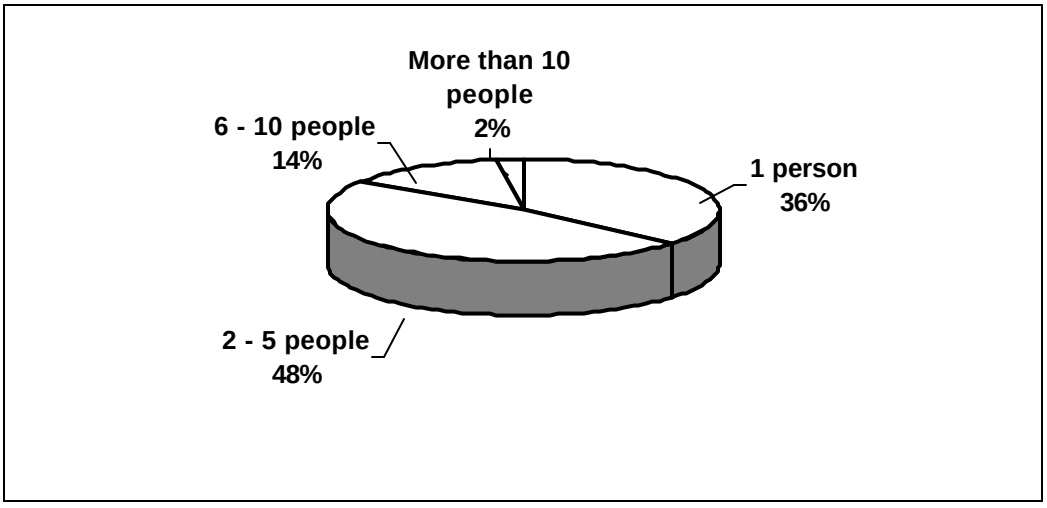
The survey collected data on business practices, such as operating hours, number of employees, and annual revenue. Most facilities are open 5 days/week, with a small percentage (16%) being open 6 or 7 days/week. Operating hours range from 5 hrs/day to 17 hrs/day, with most businesses working between 8 - 9 hrs/day. The amount of time spent on thermal spraying is fairly evenly distributed, as illustrated in Figure 6.

**Figure 6: Percent of Time Spent Doing Thermal Spraying**




The number of employees that conduct thermal spraying ranges from 1 to 13 employees per facility, with most shops reporting 1 or 2 thermal spraying employees. Figure 7 illustrates the percent of facilities at each staffing level.

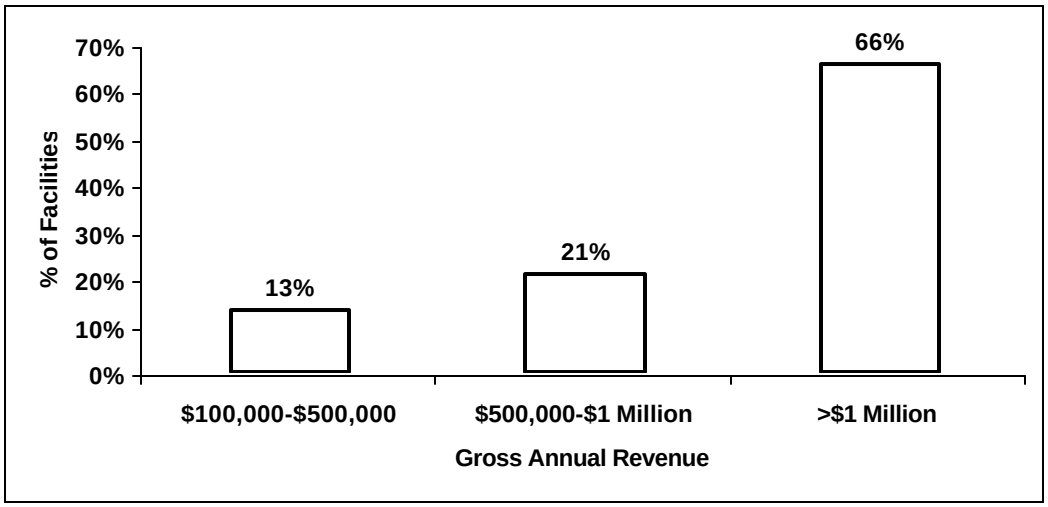
**Figure 7: Number of Employees That Perform Thermal Spraying**




The survey collected data on gross annual business revenue and the percentage of revenue that is generated by thermal spraying operations. This type of data is necessary for conducting a socioeconomic analysis, if ARB develops an airborne toxic control measure (ATCM) for thermal spraying operations. It is important to note that the revenue analysis was based on data from 83% of the facilities, as 8 businesses did not

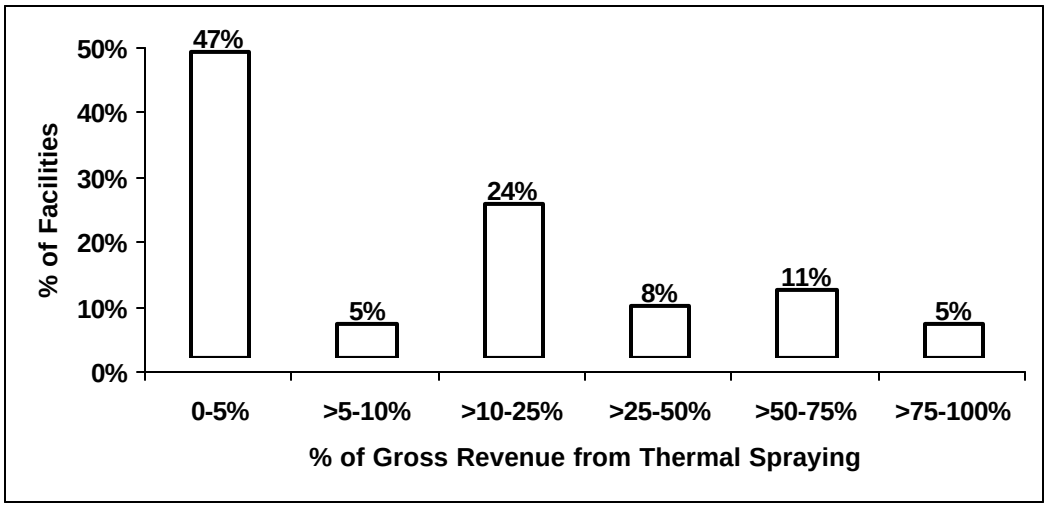
provide responses to the revenue questions in the survey. Gross revenue for most facilities exceeded $1 million per year, as shown in Figure 8.

**Figure 8: Gross Annual Revenue**




For more than half of the facilities surveyed, thermal spraying accounted for 10% or less of their annual gross revenue. Figure 9 illustrates the percentage of revenue attributed to thermal spraying operations.

**Figure 9: Percent of Revenue Generated by Thermal Spraying Operations**



## Air District Distribution

For each facility that was surveyed, ARB staff identified the corresponding local air district that has jurisdiction in the facility's area. Table 9 summarizes the number of thermal spraying facilities that were identified in each district. The table also shows the percentage of estimated material usage for each district. Figure 10 contains a map of California air districts.

**Table 9: Active Thermal Spraying Facilities in Each Air District**

| | Facility Count | | Material Usage | |
|---|---|---|---|---|
| **Air Districts** | **# in District** | **% of Total** | **Qty. Used (tons/yr)** | **% of Total*** |
| Bay Area AQMD | 9 | 20% | 8.9 | 14% |
| Feather River AQMD | 1 | 2% | 0.0 | 0% |
| North Coast Unified AQMD | 1 | 2% | 0.1 | 0% |
| San Diego APCD | 8 | 17% | 15.9 | 25% |
| San Joaquin Unified APCD | 3 | 7% | 0.3 | 0% |
| South Coast AQMD | 22 | 48% | 37.4 | 60% |
| Ventura County APCD | 2 | 4% | 0.3 | 0% |
| Totals: | **46** | | **63** | |

*Total does not add up to 100%, due to rounding.

ARB staff identified other potential facilities in the following districts, but no active thermal spraying operations were reported in: Imperial County APCD; San Luis Obispo County APCD; Sacramento Metropolitan AQMD; and Yolo-Solano AQMD.

## V. FUTURE EFFORTS

ARB staff plans to use the data from the thermal spraying facility survey to improve emission inventory estimates and to support our investigation into the potential health risks associated with thermal spraying facilities in California. This investigation will include refined air dispersion modeling and health risk assessments. Based on the results of the health risk assessments, ARB staff will determine whether it is necessary to develop an ATCM. Development of an ATCM will involve extensive consultation with stakeholders, including an industry working group and a working group for air districts. Additional information on this project can be obtained on ARB's website (http://www.arb.ca.gov/coatings/thermal/thermal.htm).

**Figure 10: California Air Districts**

# APPENDIX A

# Fact Sheets for Chemicals of Concern

# FACT SHEET

California Environmental Protection Agency
Air Resources Board

## HEXAVALENT CHROMIUM

### What Is Hexavalent Chromium?

Hexavalent chromium (Cr+6) is one of the two common valence states of chromium. Hexavalent chromium is produced by heating trivalent chromium (Cr+3) in the presence of mineral bases and oxygen, and is used in the manufacturing of paint, dyes and pigments. Hexavalent chromium can also be a by-product of an industrial process, (i.e., thermal spraying, hard chromium electroplating, stainless steel welding, power plant combustion, refining, and leather tanning).

### What Are The Sources of Hexavalent Chromium Emissions?

Hexavalent chromium is found primarily in industrial settings. Three industries that are major sources of hexavalent chromium are: metallurgical, refractory and chemical. Occupational exposure can be from thermal spraying, welding of alloys or steel, leather tanning, chromate production, textiles and wood preservatives. Exposure to hexavalent chromium can also occur from airborne emissions from chemical plants, incineration facilities, cement plants and tobacco smoke.

### Is Hexavalent Chromium A Toxic Air Contaminant?

Yes. In January 1986, the Air Resources Board (ARB/Board) published an *"Initial Statement of Reasons for Rulemaking – Proposed Identification of Hexavalent Chromium as a Toxic Air Contaminant".* The Air Resources Board reviewed epidemiological and animal studies and determined that hexavalent chromium should be considered a carcinogen *with no safe threshold level of exposure*. Based upon the evidence, ARB staff recommended that hexavalent chromium be identified as a toxic air contaminant (TAC). The Board identified hexavalent chromium as a TAC in 1986.

### What Are The Possible Health Effects From Exposure To Hexavalent Chromium?

Exposure to hexavalent chromium can be through inhalation, ingestion and dermal (skin) contact. Inhalation exposure to hexavalent chromium has been known to cause lung and nasal cancers, respiratory irritation, severe nasal and skin ulcerations and lesions, perforation in the nasal septum, liver and kidney failure and birth defects. Hexavalent chromium is mutagenic in bacterial and mammalian cell systems. As a mutagenic environmental carcinogen, it has the ability to alter the DNA base sequence.

### What Is The ARB Doing About Hexavalent Chromium Emissions?

ARB has adopted the following airborne toxic control measures (ATCM) for hexavalent chromium sources:

- February 1988 (amended May 1998)- "*Emission of Hexavalent Chromium from Chrome Plating and Chromic Acid Anodizing Operations"* which requires owners/operators of electroplating operations to use air pollution control devices;
- March 1989 - "*Chromate Treated Cooling Towers"* which prohibits adding hexavalent chromium to cooling tower circulating water*;* and
- September 2001 - *"Emissions of Hexavalent Chromium and Cadmium from Motor Vehicle and Mobile Equipment Coatings*", which prohibits the use of hexavalent chromium in automotive paints.

ARB's Neighborhood Assessment Program monitors the impacts of hexavalent chromium emissions on communities. The data collected assists in developing guidelines for reducing the impact of air pollution on the neighborhood scale. For additional information about ARB's activities regarding hexavalent chromium, please visit our website at *www.arb.ca.gov/homepage.htm*.

# FACT SHEET

California Environmental Protection Agency
Air Resources Board

## NICKEL

### What Is Nickel?

Nickel is a silvery metal that is very resistant to corrosion, is highly malleable and has good thermal and electrical conductivity.

### What Are The Sources Of Nickel Emissions?

Nickel air emissions are generated by a variety of sources including: thermal spraying; tobacco smoke; electroplating; smelting, incineration; cement manufacturing; motor vehicle exhaust; mining; milling; and oil refining. Nickel also occurs naturally in soils, sea spray, forest fires and vegetation. Nickel is carried in the air, in water and soil by weather, erosion, runoff and water flow. Some of the industries that use nickel are: aerospace; automotive; computers; electronics; machine shops; military; refineries; and power plants.

### Is Nickel A Toxic Air Contaminant?

Yes. In June 1991, the Air Resources Board (ARB/Board) published an "*Initial Statement of Reasons for Rulemaking – Proposed Identification of Nickel as a Toxic Air Contaminant*". This report evaluated scientific evidence regarding the presence of nickel in the atmosphere and its potential adverse effects on public health. ARB staff recommended that nickel be identified as a toxic air contaminant (TAC) based on the evidence that nickel is a carcinogen that presents a public health risk. The Board identified nickel as a TAC in 1991.

### What Are The Possible Health Effects From Exposure To Nickel?

There are three types of adverse health impacts that can occur as a result of exposure to nickel:

(1) *Cancer*. Lung and nasal cancer can be caused by inhalation of nickel.
(2) *Acute.* Health effects such as irritation and allergic sensitization can result from short-term, large dose exposures.
(3) *Chronic*. Non-cancer health effects. Asthma and other respiratory ailments can result from long-term exposure to nickel.

### What Is The ARB Doing About Nickel Emissions?

ARB adopted an airborne toxic control measure for non-ferrous metal melting operations which is expected to reduce emissions of nickel from this process by 99%. From 1990 to 2000, the average ambient nickel concentration in California was reduced by approximately 30%. The ARB's Neighborhood Assessment Program monitors the impacts of nickel emission sources in communities. The data collected assists in developing guidelines for reducing air pollution impacts at the neighborhood scale (for additional information on this program please see our website at *http://www.arb.ca.gov/ch/ch.htm.)*

*For additional information regarding nickel or other toxic air contaminants and ARB's ongoing efforts and activities, please visit our website at* http://www.arb.ca.gov/homepage.htm .

# APPENDIX B

# 2004 Thermal Spraying Facility Survey Form

# A. THERMAL SPRAYING FACILITY SURVEY

## I. GENERAL FACILITY INFORMATION

**NAME OF FACILITY:**

**IS YOUR FACILITY A WHOLLY OWNED SUBSIDIARY OF ANOTHER COMPANY:** ❑ **YES** ❑ **NO**

**If "Yes", please provide parent company name:**

**CONTACT PERSON:**

**TITLE:**

**ADDRESS:**

**PHONE:**

**FAX:**

**E-MAIL:**

## II. EQUIPMENT INFORMATION

| | | |
|---|---|---|
| **Type Of Thermal Spraying**: | ❑ Flame Spraying | ❑ Electric Arc Spraying |
| | ❑ Plasma Arc Spraying | ❑ High-Velocity Oxy-Fuel (HVOF) |
| | ❑ Detonation Gun | ❑ Other (Describe)_____ |

| | |
|---|---|
| **Is Thermal Spraying Conducted In A Booth?** | ❑ YES ❑ NO |

**If YES, Please Describe Booths And Control Devices:**

| **BOOTH #1:** | |
|---|---|
| Type of Booth:<br>❑ Complete Enclosure<br>❑ Partial Enclosure<br>Ventilation System?<br>❑ YES ❑ NO | Control Device:<br>❑ Dry Filter Cartridge ❑ HEPA Filter<br>❑ Water Curtain ❑ Wet Scrubber<br>❑ Other (Describe) _____<br>Changeout Frequency _____ |
| **BOOTH #2:** | |
| Type of Booth:<br>❑ Complete Enclosure<br>❑ Partial Enclosure<br>Ventilation System?<br>❑ YES ❑ NO | Control Device:<br>❑ Dry Filter Cartridge ❑ HEPA Filter<br>❑ Water Curtain ❑ Wet Scrubber<br>❑ Other (Describe) _____<br>Changeout Frequency _____ |

**If NO, Do You Use Portable Thermal Spraying Equipment?** ❑ YES ❑ NO

Complete Enclosure

Partial Enclosure

# A. THERMAL SPRAYING FACILITY SURVEY

**(cont'd)**

## III. MATERIALS INFORMATION

**Type Of Materials Used:** ❑ Powder ❑ Wire ❑ Other (Describe)_____

**Metals Used:** ❑ Chromium ❑ Nickel ❑ Cobalt ❑ Manganese

❑ Other (Describe) _____

**Estimated Quantities Used Annually:** _____ ❑ Lbs/yr ❑ Tons/yr ❑ Kgs/yr

## IV. FACILITY OPERATING INFORMATION

Days of Operation: _____ Operating Hours: ____ a.m. to ____ p.m.

**Hours Per Day Doing Thermal Spraying**

❑ Less Than 1 Hour ❑ 1 – 4 Hours ❑ Greater Than 4 Hours

Total Number Of Employees: _____

Number Of Employees Doing Thermal Spraying: _____

**Gross Annual Revenue For Facility:**

❑ Less Than $100,000 ❑ $100,000 to $500,000 ❑ $500,000 to $1,000,000

❑ Greater Than $1,000,000

**Percentage Of Revenue From Thermal Spray Operations:** _____%

❑ Please check this box if you wish the survey data to be confidential* .

## THANK YOU!

**Please return completed survey by February 9, 2004, to:**

**FAX**: 916-324-8026, Attention – Monique Davis

OR

**MAIL**:
Air Resources Board
Stationary Source Division, MAB
Attn: Monique Davis
P.O. Box 2815
Sacramento, CA 95812

**Questions**? Contact Monique Davis at 916-324-8182 or e-mail mdavis@arb.ca.gov

***** ***In accordance with title 17, California Code of Regulations (CCR), sections 91000 to 91022, and the California Public Records Act (Government Code section 6250 et seq.), the information that a company provides to the Air Resources Board (ARB) may be released: (1) to the public upon request, except trade secrets which are not emissions data or other information which is exempt from disclosure or the disclosure of which is prohibited by law; (2) to the United States Environmental Protection Agency (U.S EPA), which protects trade secrets as provided in section 114(c) of the Clean Air Act and amendments thereto (42 USC 7401 et seq.) and in federal regulation; and (3) to other public agencies provided that those agencies preserve the protections afforded information which is identified as a trade secret, or otherwise exempt from disclosure by law (section 39660(e)).***